

Joint Nuclear and Astrophysics Seminar

- When: Friday April 28th at 2:00 PM
- Where: Cyclotron Institute seminar room 228
- Speakers: Theodoros Depastas and Jack Birkin

An α -cluster microscopic study of $^{12}\text{C} + ^{12}\text{C}$ fusion towards the zero-energy limit By Theo Depastas, Cyclotron Institute, Texas A&M University.

In this work, we utilize the hybrid α -cluster (hac) model and an analytical approach, both in the framework of the Imaginary Time Method (ITM), to study the $^{12}\text{C} + ^{12}\text{C}$ fusion reaction in the 0-7 MeV energy region. We obtain the values of the astrophysical factors and observe interesting collective sub-barrier phenomena. We also include a calculation for the ^{12}C (g.s.) + ^{12}C (4.44 MeV, 2^+) fusion reaction and discuss a possible experimental investigation using the Trojan Horse Method (THM). Our results are comparable to recent experimental data and confirm theoretical mean-field and macroscopic approaches.

Mapping the metal enrichment in $z\sim 4$ dusty star-forming galaxies on sub-kpc scales By Jack Birkin, Physics and Astronomy Department, Texas A&M University.

In redefining what it means to be “high redshift”, JWST is making possible the kinds of studies at $z\sim 4$ that could previously only be done in the nearby Universe, especially for highly dust-obscured star-forming galaxies that are rare locally but dominant contributors to the total SFR density at higher redshifts. As part of the TEMPLATES DD-ERS program, we have observed two strongly lensed dusty galaxies at $z\sim 4$. I will present some early highlights from the TEMPLATES observations of these dusty systems. In particular I will focus on using the NIRSpec IFU data to map the rest-frame optical emission lines, which are critically important tracers of the ISM properties but were inaccessible at these redshifts in the pre-JWST era. Our data easily detect and resolve on sub-kpc scales the H-alpha, [NII] and [SIII] lines. I will utilize such lines to present the first resolved maps of the gas-phase metallicity in these explosive yet elusive galaxies, suggesting high levels of metal enrichment likely as a result of their extremely rapid star formation. In addition, the BPT diagnostics hint at the presence of previously undetected obscured AGN in these systems. The data clearly show the impressive capabilities of JWST, and I will discuss their implications for our understanding of the DSFG population and galaxy evolution in general.